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The Role of Alcohol in Suicides in Erie County, NY, 1972-84

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Synopsis

A discriminant analysis of the 806 suicide victims in Erie County, NY, from 1972-84, compared those

with alcohol in the blood to those without. Thirty-three percent of the victims had alcohol in their blood. Those with blood alcohol present were more likely to demonstrate such characteristics as being male, leaving no note, being found in a vehicle, having no prior attempt, using a gun, killing themselves in the evening or at night, and not being under psychiatric treatment.

The results are interpreted to mean that alcohol is a contributory cause of impulsive suicides. Suicides related to long-standing conditions, such as chronic depression or physical illness, which are less spontaneous and more predictable, are less likely to involve alcohol. The alcohol-related suicide is more likely to be impulsive.

Alcohol-involved suicides reflect general drinking patterns, with men drinking more than women, and most drinking being done in the evening.

THE SUICIDE RATE in the United States has been increasing since the late 1950s (1,2), although a recent, slight decrease has been noted (3). The suicide rate for males notably exceeds that for females. Suicide rates are highest among elderly males, although recently their rate has decreased (1,2). The suicide rate for whites usually is greater than that for most other races, with the exception of American Indians (2). Suicide is less prevalent in Midwestern States and more common in Eastern and Western locales (2). Self-inflicted death tends to occur at a higher rate in urban areas (4).

Adolescents show the greatest increase in suicide rates, a change especially noticeable for males (1,2,5). Self-inflicted gunshot wounds, followed by poisoning and asphyxiation, are the most common

methods of suicide (2). Boyd (1) concludes that the rise in suicide by firearms drives the overall increase in the suicide rate. Brent and coworkers (5) have found that suicide by firearms has increased faster than all other methods in their study of youthful victims in Allegheny County, Pennsylvania, during 1960-83.

Alcohol is frequently found in the blood of suicide victims. Roizen (6) found that 15 out of 20 studies of suicide had shown alcohol in the blood of 20 percent or more of the victims. Haberman and Baden (7) found alcohol in the blood of 32 percent of suicide victims in New York City. Ford and coworkers (4) found alcohol in the blood of 25 percent of those who committed suicide in Cuyahoga County (Cleveland), Ohio, during 1959-74.

Not only is alcohol often found in the context of suicide, but suicide is an unusually common cause of death among chronic heavy drinkers (8). However, the nature of the relationship between alcohol and suicide is not clear. The acute influence of alcohol may contribute to suicide for some people who otherwise would not have done so.

Russell and Mehrabian (9) recognized the importance of situational variables—the setting, prior emotional state, personality, and alcohol dose—on the drinker's emotional state. The acute effects of moderate alcohol intake may lead to disinhibition and therefore increased risk taking, anger, and a higher level of anxiety, especially in stressful situations (9). Unpredictable, explosive, and aggressive behaviors characterize the “abreactive” suicide attempts that are associated with the onset of a drinking episode (10).

Except for large doses, which tend to exacerbate depression, alcohol can either increase or decrease depression depending on the original emotional state of the drinker (9). Mayfield and Montgomery (10) found a depressive type of suicide attempt that tends to follow a prolonged bout (greater than 2 weeks) of excessive drinking.

It is likely that the deterioration of lives caused by chronic alcoholism contributes to the despair that leads to suicide. Kendall (11) found that suicide tends to come late in the cycle of alcoholism, usually preceded by such high risk factors as attempted suicide and divorce.

Alternatively, there may be no causal relationship between alcohol and suicide, except that the types of persons who drink frequently are more likely to kill themselves. However, Bell and co-workers (12), in a study of the general population, found no association of suicide ideation and high depression with drinking patterns.

Examination of the circumstances of alcohol being present in the blood of suicide victims helps explain alcohol's role in suicide, about which little is known. For this reason, we systematically compared suicides in which alcohol was present to those in which it was not.

Methods

Erie County is in the northwestern part of New York State. Erie is the 24th largest county in the United States, with a population of about 1,015,500. Buffalo is the main city in the county, with a population of 357,900 (13). The 1980 census (13) found that the population of Erie County was about 88.1 percent white, 10.2 percent black, 1.4

Table 1. Alcohol in the blood of suicide victims by sex, race, and age; Erie County, NY, 1972–84

Characteristic	Victims with alcohol in blood	
	Number	Percent
Male	552	37
Female.....	254	26
White	720	34
Black	63	33
Hispanic.....	8	38
American Indian.....	13	39
Younger than 21 years	101	30
21–40 years	353	35
41–60 years	248	38
Older than 60 years	104	24

NOTE: Chi-square statistic for sex is significant at .01 level. Chi-square statistic is not significant for race and age at .05 level.

percent Hispanic, .6 percent Asian, and .5 percent American Indian.

Information concerning all suicides in Erie County, in the period 1972–84 was obtained from a retrospective analysis of the files of the Chief Medical Examiner. The files contain a standard “Identification of Body Form” questionnaire which describes the race, sex, age, and date of death of the victim; circumstances of the death; and results of the toxicologic analyses of blood alcohol level (BAL) and drug content. All suicide cases in the files were included in the study. Sampling of BAL usually was performed within 8 hours of death. Gas chromatography was used to measure blood alcohol content.

The medical examiner estimated the time of death, which might differ from the time that the body was found. Interviews with the physician and relatives of the victim and a search of hospital records provided information on past psychiatric treatment. The apparent reason for the suicide was determined from a note, if one was left, and through interviews with the victim's friends and family. Interviews and record searches, as well as physical evidence, such as scars, were used to determine any history of suicide attempt. Our analysis strategy was:

(a) A stepwise discriminant function analysis was used to select variables able to discriminate with statistical significance ($P < .1$) between suicide victims with alcohol in the blood and those without. We used the liberal $P < .1$ criteria in examining a range of variables which could still be interpreted in light of their statistical significance, including age, race, sex, time of day of the suicide, history of suicide attempt, presence of a suicide note, history

Table 2. Discriminant analysis of presence of group variable and the absence of alcohol in the blood of 806 suicide victims

Predictor	Standardized coefficient	Significance of F-to-remove	Interpretation
Tranquilizer in blood.....	.31	.01	Tranquilizer in blood, HPA ¹
Sex.....	.24	.07	Males, HPA
Note.....	-.24	.05	Left no note, HPA
Age in years ²25	.04	Age 21-60, HPA
Human relations problem.....	.33	.01	Human relations problem, HPA
Found in vehicle.....	.45	.001	Found in vehicle, HPA
Use of gun.....	.24	.06	Used gun, HPA
Prior attempt.....	-.22	.09	No prior attempt, HPA
Evening or night.....	.37	.002	Died in evening or night, HPA
Psychiatric treatment.....	-.22	.10	No psychiatric treatment, HPA

¹ HPA = higher probability of alcohol in blood.

² 21 through 60 years versus younger than 21 or older than 60 years.

Table 3. Suicide predictability score and alcohol in blood of 806 suicide victims

Score	Number of suicides	Percentage with alcohol in blood
0.....	353	43
1.....	262	29
2.....	157	25
3.....	31	23
4.....	3	0

NOTE: Chi-square statistic is significant at .0001 level.

of psychiatric care, place where the body was found, apparent reason for the suicide, method of suicide, and drugs in the blood. Categorical variables were represented by 0, 1 “dummy” variables.

Stepwise discriminant analysis is a statistical technique that selects the variables that best show the differences between two or more groups. The stepwise technique sequentially enters variables into a discriminant function—a linear combination of variables that separates the groups—and retains those variables that meet a specific probability criterion. The predictor variables are interpreted by their standardized coefficients, which are similar to the beta coefficients used in multiple regression.

Positive coefficients indicate predictor variables that are associated with large values of the discriminant function; negative coefficients are associated with small function values. In this study, large discriminant function values indicated a higher probability of alcohol in the blood of the victim, while low values indicated a lower probability.

(b) Pursuing effects uncovered by the discriminant analysis, we examined the relationship between “predictability” of a suicide and the presence of alcohol in the blood, as well as the relationship between chronological patterns of suicide and alcohol in the blood.

Results

The demographic characteristics of the suicide population (table 1) tend to coincide with those of the county, with a few notable exceptions. None of the suicide victims was recognized as of Asian descent. The percent of suicides by American Indians (about 1.6 percent of the total) was more than triple their proportional representation in the population of Erie County.

Thirty-three percent of the 806 suicide victims in Erie County from 1972-84 had alcohol in the blood. Table 1 shows the percent of victims with alcohol in the blood for several demographic categories. Men were significantly more likely to have blood alcohol content than women, but there was no significant relationship with race or age. Of those victims with alcohol in the blood, 86 percent had BALs greater than or equal to .05 percent. Sixty percent of the alcohol-bearing cases were legally intoxicated (BAL of .1 percent or higher).

Table 2 shows the results of the discriminant function analysis. The suicide victims most likely to have alcohol in the blood showed the following characteristics: male, aged 21-60 years, tranquilizer in the blood, no suicide note, committed suicide because of human relations problems, committed suicide in a vehicle (not auto crash), used a gun, no known suicide attempt, committed suicide in the evening or at night, and not under psychiatric treatment. The relationships with sex and age are not surprising. In the general population, males drink more than women; young adults and the middle aged drink more than children or the elderly (14). Drug users drink more than the average (15), although it is not clear why drugs, other than tranquilizers, showed no significant relationship with alcohol. There is more drinking in the evening and night than in the morning or afternoon.

Table 4. Distribution of 800 suicides over 28 weekly time slots, percent with alcohol in blood, and mean predictability scores

Characteristic	Morning	Afternoon	Evening	Night	Total
<i>Monday</i>					
Percent with alcohol.....	29	30	47	38	33
Number.....	38	47	17	16	118
Score.....	.58	.98	.67	.94	.80
<i>Tuesday</i>					
Percent with alcohol.....	52	16	37	49	34
Number.....	21	43	38	23	125
Score.....	.52	1.02	.89	.75	.85
<i>Wednesday</i>					
Percent with alcohol.....	21	20	30	36	25
Number.....	28	30	37	11	106
Score.....	1.00	.93	.89	1.09	.95
<i>Thursday</i>					
Percent with alcohol.....	32	41	43	42	39
Number.....	31	44	28	12	115
Score.....	.61	.91	.72	.83	.78
<i>Friday</i>					
Percent with alcohol.....	33	31	43	43	35
Number.....	36	39	28	7	110
Score.....	1.03	.98	.71	.57	.90
<i>Saturday</i>					
Percent with alcohol.....	29	25	29	62	34
Number.....	31	28	31	21	111
Score.....	1.00	.93	.68	.86	.87
<i>Sunday</i>					
Percent with alcohol.....	34	24	42	48	36
Number.....	29	34	31	21	115
Score.....	.90	1.00	.62	.62	.80
<i>Total</i>					
Percent with alcohol.....	32	27	38	47	34
Number.....	214	265	210	111	800
Score.....	.81	.97	.76	.80	.85

The analysis of significant variables suggests that alcohol-related suicides are more spontaneous and less predictable than nonalcohol-related suicides. To test this possibility, we constructed a “predictability” scale. Suicides were given one point for each of the following factors: left a note, diagnosed as depressed, poor health as the cause, suicide attempt, and under psychiatric care. This scale reflects the extent to which a suicide is related to a long-standing condition (suicide attempt, depression, psychiatric care, or poor health), or is not impulsive, as suggested by some preparation. Use of a gun could be associated, with impulsive suicide for victims who already had a gun. However, the connection between use of a gun and spontaneity was not clear enough to include in the scale.

Table 3 shows the relationship between the scale and alcohol in the blood of the victim. Suicides which were less predictable and more impulsive were more likely to show alcohol in the blood of the victim.

To examine a chronological factor for suicide in Erie County, we created a collapsed data set of 28 cases corresponding to 28 6-hour time periods in

Table 5. Correlation matrix of suicides over 28 weekly time slots by percent with alcohol in blood and mean predictability scores

Variables	Percent with alcohol	Number	Score
Percent with alcohol.....	1.00
Number of suicides.....	¹ -.52	1.00	...
Mean predictability.....	² -.49	³ .31	1.00

¹ P = .002. ² P = .004. ³ P = .052.

the week (table 4). The three variables of interest were the number of suicides during the “time slot,” the percent of victims with alcohol in the blood, and the mean “predictability” score for suicides in that time slot. Table 4 shows that a larger proportion of suicides that occur in the evening and night involve alcohol than those that occur in the morning and afternoon. Suicides in the evening and night tend to have low mean “predictability” scores.

We correlated the three variables used in the time slot analysis (table 5). As noted, suicides with alcohol have lower “predictability” scores. They

tend to take place at night when the number of suicides generally is lower. There is a positive relationship between the predictability of suicides and their occurrence when suicides are more common. The picture emerges of a certain type of suicide, characterized by unpredictability, with alcohol in the blood, and happening at night.

Discussion

Our data suggest that alcohol tends to be associated with those suicides that are impulsive, rather than those based on long-standing deliberation. There is more likelihood in the alcohol-related suicide for there to be no note, no known suicide attempt, and no long-standing condition to which the suicide can be related. The weapon is more likely to be a gun. The victim is more likely to be found in a vehicle. Our characterization of the alcohol-related suicide is congruent with the findings of Peterson and associates (16), who studied 30 cases of nonfatal, self-inflicted gun-shot wounds. They found that 15 had used alcohol or drugs before the wounding, that 18 had experienced interpersonal conflict, and that none had written a suicide note. They hypothesized a special type of impulsive, gun-wielding suicide attempter.

Our findings that alcohol-related suicides are more prevalent at night agree with the results found by Varadaraj and Mendonca (17) in their analysis of 158 suicide attempters admitted to an emergency ward at a British hospital. Higher blood alcohol levels were associated with male suicide attempts on weekends and with female attempts on weekdays; females had significantly higher BALs during nighttime attempts (17).

Conclusion

Does alcohol play a causal role in any of these suicides? Unlike homicide, suicide is least prevalent during the peak evening drinking hours. It is possible that most victims simply drink to prepare themselves for what they already are determined to do. However, if this were so, they might be expected to leave notes or give other signs of preparation. It is possible that the type of person who commits suicide impulsively is more likely to be a drinker.

Nevertheless, the large number of persons under the influence of alcohol who kill themselves (5,6,7), and the correlation that we found of drinking with impulsive suicide, strongly suggest that significant numbers of suicide victims would not have committed

the act had they not been drinking. Alcohol clearly is implicated as a causal factor and a frequent triggering agent in suicide.

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